

MULTIMEDIA



UNIVERSITY

STUDENT IDENTIFICATION NO

--	--	--	--	--	--	--	--	--	--

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

BDE 2014 – DIFFERENTIAL EQUATIONS

(All Sections / Groups)

03 JUNE 2016

3.00 p.m. – 5.00 p.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 2 pages.
2. Attempt all 4 questions. The distribution of marks for each question is given.
3. Students are allowed to use scientific calculators.
4. Please write your answers in the **Answer Booklet** provided.

Question 1 [Total = 25 marks]

- a) Find the implicit solution to the following equation:

$$(e^y + 3y^2) \frac{dy}{dx} - 2x = 0$$

[5 marks]

- b) Solve the following differential equation by separating it:

$$\frac{dy}{dx} = \frac{x^3 + 2y^3}{xy^2}$$

[12 marks]

- c) Find the solution to the following exact differential equation:

$$y + 2x + x \frac{dy}{dx} = 0$$

[8 marks]

Question 2 [Total = 25 marks]

- a) Find the solution to the following differential equation:

$$y'' + 10y' + 25y = 0 \quad \text{where } y(0) = 1 \text{ and } y'(0) = 2$$

[10 marks]

- b) Consider the following differential equation (DE):

$$y'' + 4y' + 3y = 3x + 10$$

- (i) Find the complementary function, y_h of the above DE.
- (ii) Find the particular function, y_p of the above DE.
- (iii) Find the general equation, y of the above DE.

[15 marks]

...Continued

Question 3 [Total = 25 marks]

- a) Find the general solution for the following non-homogenous Cauchy-Euler equation by using variation of parameters method:

$$x^2 y'' - xy' + y = x^3$$

[14 marks]

- b) Solve the following partial differential equation (PDE):

$$\frac{\partial^2 z}{\partial y^2} - 5 \frac{\partial z}{\partial y} + 6z = 0$$

subject to the condition that when $x=0$, $\frac{\partial z}{\partial y} = x$ and $\frac{\partial z}{\partial x} = 2$

[11 marks]

Question 4 [Total = 25 marks]

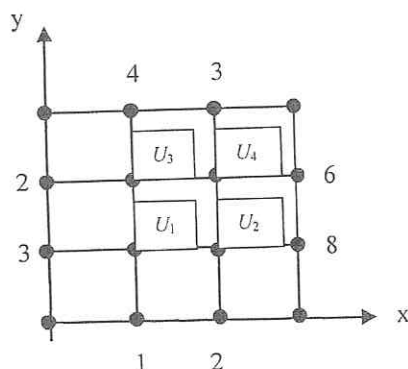
- a) Find the partial differential equation by eliminating the arbitrary constants a and b from the relation

$$x^2 + y^2 + (z - b)^2 = a^2$$

[9 marks]

- b) Given the values of $u(x,y)$:

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 3x - y^2$$



- (i) With mesh length, $h=1$ for the square as in figure above, and assume that $(u_2, u_3, u_4) = (0, 0, 0)$, find the initial values of u .
- (ii) Improve the values in (i) using Gauss-Seidel iteration. Iterate the process up to three iterations. [Use 4 decimal places for all the workings].

[16 marks]

End of paper

